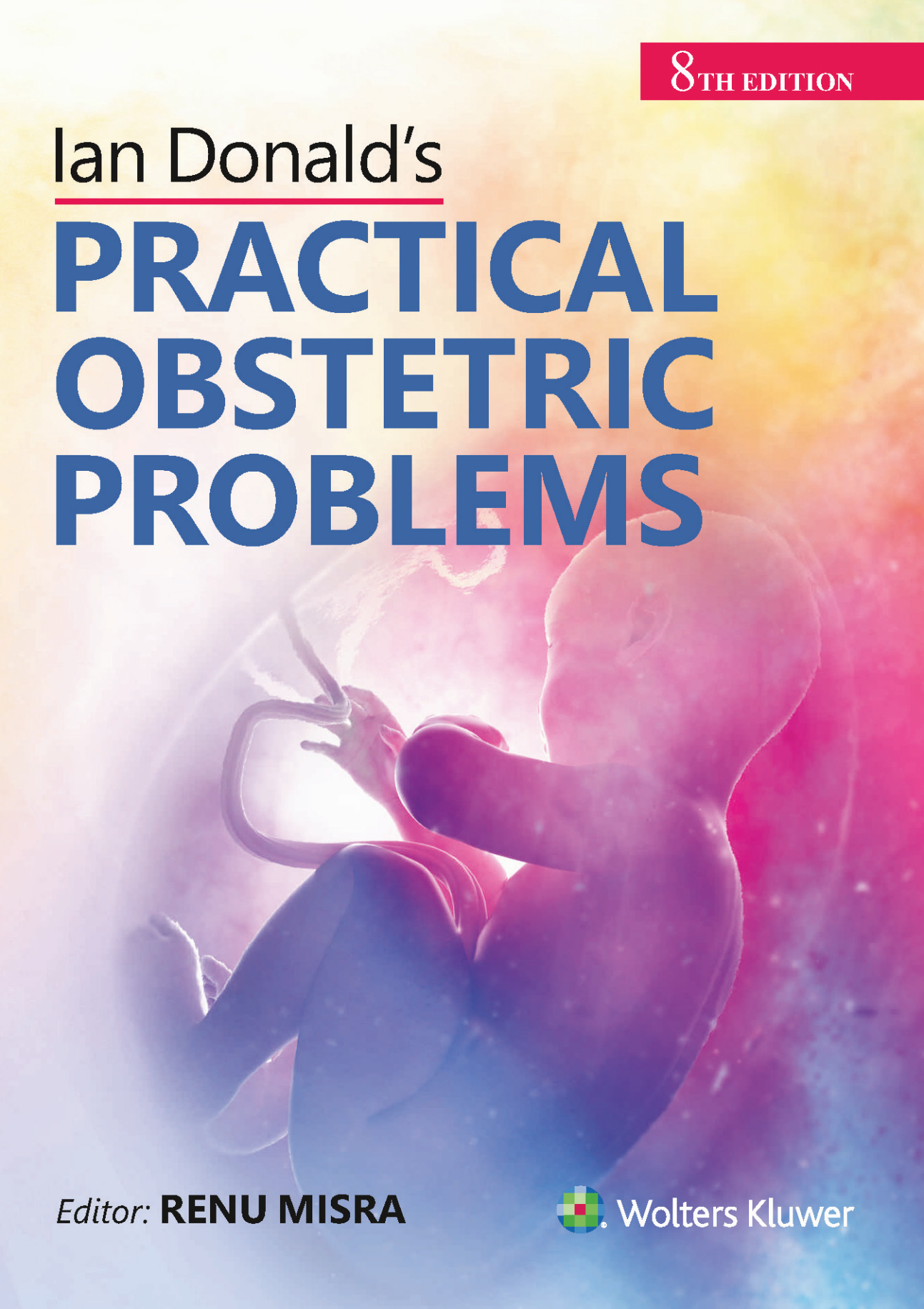
8TH EDITION

Ian Donald's PRACTICAL OBSTETRIC PROBLEMS



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Wolters Kluwer

Ian Donald's
Practical Obstetric Problems

Eighth Edition

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Antenatal care

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With the ever-increasing expectation of a perfect outcome of pregnancy and that 'nothing should go wrong with the mother or the baby', the obstetrician's stress is leading to increasing medicalization of normal pregnancy. The calendar of pregnancy and labour is marked by advice on diet, lifestyle, blood tests, ultrasound scans and fetal monitoring. The population profile of the pregnant women has also changed in recent times. It now includes women that are older, obese, sedentary and with pre-existing medical and surgical conditions, factors which increase their risk during pregnancy and labour. This is a common urban or the metro scenario.

India being a land of extremes in social demography, the problems in the rural and less resourceful society are different from those in the affluent settings. The obstetrician here still battles with anaemia, undiagnosed heart conditions, maternal infections, besides poor infrastructure to deal with emergencies and facilities to transport to higher centres. Nevertheless, the thrust in the last decade on better antenatal care facilities at primary and secondary care levels and institutional deliveries by the Government of India, coupled with general awareness in the population has contributed to a significant decline in maternal mortality in various parts of the country.

While the hazards of pregnancy and labour to the mother continue to recede, those to the fetus during its intrauterine existence have come to be recognized more explicitly. The first 38 weeks of human life spent in the presumably protected environment of the amniotic sac are medically more eventful and fraught with danger and accident than the next 38 years of life. The scope of antenatal care is, therefore, widening rapidly. Much has been achieved over the last century and a brief look into the history shows how far we have come.

1 History

Antenatal care began as a social service in Paris in 1788 for women who had committed the double offense of being both pregnant and destitute. These pitiable creatures were housed, sometimes two or three to a bed, in the Hôtel Dieu and Hôpital Salpetrière from the 36th week of pregnancy onwards. It was in Edinburgh at the very end of the 19th century that the first effective medical and scientific interest was shown in the antenatal patient. In 1902, the first antenatal bed was endowed for the purpose. Admittedly Ballantyne's original concern was fetal deformity and stillbirth, but this soon came to embrace a wider interest in maternal wellbeing, which on more general adoption by the end of World War I had swamped concern for the unborn child. In fact until the period following World War II it was thoughtlessly assumed that antenatal care that was good enough for the mother was good enough to cover the needs of the baby as well.

A few heretics talked about 'antenatal paediatrics' but they were not taken very seriously. This complacency was shaken first by the recognition of the possible effects of certain viruses upon the baby following Gregg's observations in 1941 in Australia on the association between maternal rubella in early pregnancy and cataract[1] and secondly by Dr. Alice Stewart's enquiry in 1956 into the harmful effects of X-rays upon the fetus, increasing the hazard of leukaemia in later childhood,[2] and finally at the end of 1961, came the terrible tragedy of thalidomide-deformed babies[3–6] after the association between this drug and limb and intestinal deformities was first suspected in Western Germany. The firm supplying thalidomide very rightly withdrew the drug from sale at the first suggestion of responsibility, but even so it was estimated that not less than 800 babies in the UK alone were likely to have been damaged. This epidemiological investigation provided much food for thought. If such a catastrophe could follow the taking, in early pregnancy, of so apparently harmless a sedative and anti-emetic as thalidomide, then what of the possible effects of all sorts of other agents, drugs, poisons, radiations, metabolic diseases, even psychosomatic and stress disorders? Old wives' tales have long told of how important it was that the mother should be in a happy frame of mind to ensure a healthy and happy baby. It has now been confirmed using multiple regression analysis that alcohol intake in pregnancy, gestational depression, low educational level and the occurrence of negative life events during pregnancy are associated with low neuro-developmental scores subsequently.[7]

We are now all aware of the intrauterine vulnerability of the baby. Advances in diagnostic modalities and intrauterine therapy mean that congenital abnormalities can no longer be accepted with fatalism. And so the wheel has turned full circle and Ballantyne's original teratological interest is revived. Technological advancements that facilitate antenatal detection of fetal birth defects and fetal compromise like ultrasonography, maternal serum markers, biochemical tests for metabolic defects, fetal karyotyping and Doppler ultrasound have become an integral part of our current obstetric practice. Increased awareness on the part of patients has meant an increase in their role in decision making regarding management strategies during pregnancy and the mode of delivery. Newer developments like the practice of evidence-based medicine, the mapping of the human genome and the emphasis on outcomes-based research will further change the face of future obstetrics, hopefully working in synergy, to fulfil the primary aim of antenatal care, which is to reduce maternal and perinatal morbidity and mortality.

2 Maternal mortality

Maternal mortality is defined by World Health Organization (WHO) as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related or aggravated by the pregnancy but not from accidental or incidental causes.

Direct obstetric deaths. They are those resulting from obstetric complications during pregnancy, delivery and postpartum. Deaths due to, for example haemorrhage, pre-eclampsia/eclampsia, complications of anaesthesia or caesarean section are classified as direct obstetric deaths.

Indirect obstetric deaths. They are those resulting from previous existing disease, or diseases developing during pregnancy, not due to direct obstetric causes but aggravated by physiological

effects of pregnancy. For example, deaths due to aggravation of an existing cardiac or renal disease are indirect obstetric deaths. An amendment made to ICD-10 (International Classification of Diseases) in 2010 now includes indirect maternal deaths due to HIV in maternal mortality.

The scope of maternal mortality has been widened in the ICD-10 to include **pregnancy-related death**, which is defined as any death during pregnancy, childbirth, or the postpartum period even if it is due to accidental or incidental causes. Complications of pregnancy can sometimes lead to death after the six weeks postpartum period; these are now categorized as **late maternal deaths.** Late maternal death is defined as death of a woman from direct or indirect obstetric causes, more than 42 days but less than one year after the termination of pregnancy.

2.1 Measures of maternal mortality

- **Maternal mortality ratio (MMR).** It is the number of maternal deaths during a given time period per 100,000 births during the same time period.
- **Maternal mortality rate.** It is the number of maternal deaths during a period per 100,000 women of reproductive age during the same time period.
- **Adult lifetime risk of maternal death** is the probability of dying from a maternal cause during a woman's reproductive lifespan.

Although maternal mortality worldwide has dropped by 44% between 1990 and 2015, it is still unacceptably high. Approximately 830 women die every day due to causes related to pregnancy and childbirth, 99% of these deaths occur in developing countries. The risk is greater in rural and low socioeconomic population, and in young adolescents.[8]

National Rural Health Mission (NHRM), now under National Health Mission, was launched in 2005 by the Government of India. One of the key initiatives of NHRM was Janani Suraksha Yojna, which promoted institutional delivery with the aim to provide safe delivery and emergency obstetric care in rural areas. As a result, India shown a remarkable decline in MMR by 77%, from 556 per 100,000 live births in 1990 to 130 per 100,000 live births in 2016. Under millennium development goal 5 (MDG 5), the goal was to reduce the maternal mortality by 75% between 1990 and 2015. Though it was not achieved by 2015, India's present MMR is below MDG target and the country is now committed to achieve the United Nations Sustainable Development Goal (SDG) target of an MMR below 70 by 2030.[9]

Table 1.1 shows estimates of MMR and lifetime risk in different United Nations Millennium Development Goal (MDG) regions, 2015[10] and Table 1.2 shows MMR, maternal mortality rate and lifetime risk in different states of India as reported by Sample Registration System, Office of Registrar General India 2014–16.[11] The MMR in India has declined by 68.7% between 1990 and 2015. The National Health Policy 2017 target was to achieve an MMR of 100 per 100,000 live births by 2020, which has been achieved by 11 states ahead of time. The next SDG target 3.1 given by WHO calls for a reduction in the global MMR to less than 70 per 100,000 by 2030.

Table 1.1 Estimates of maternal mortality ratio (MMR) and lifetime risk in different Millennium Development Goal (MDG) regions, 2015[10]

MDG regions	MMR	Lower estimate	Upper estimate	Lifetime risk of maternal death 1 in
World	216	207	249	180
Developed regions	12	11	14	4900
Developing regions	239	229	275	150
Northern Africa	70	56	92	450
Sub-Saharan Africa	546	511	652	36
Eastern Asia	27	23	33	2300
Southern Asia	176	153	216	210
South Eastern Asia	110	95	142	380
Western Asia	91	73	125	360
Central Asia	33	27	45	1100

Table 1.2 Maternal mortality ratio (MMR), maternal mortality rate and lifetime risk of death in India and its states (SRS 2014–16)[11]

	MMR	Maternal mortality rate	Lifetime risk %
INDIA TOTAL	**130**	**8.8**	**0.3**
Assam	237	16.2	0.6
Bihar/Jharkhand	165	15.8	0.6
MP/Chhattisgarh	173	15.7	0.5
Odisha	180	12.3	0.4
Rajasthan	199	18.3	0.6
UP/Uttarakhand	201	17.1	0.6
Andhra Pradesh	74	3.6	0.1
Telangana	81	4.2	0.1
Karnataka	108	8.4	0.3
Kerala	46	2.1	0.1
Tamil Nadu	66	5.2	0.2
Gujarat	91	6.4	0.2
Haryana	101	8.2	0.3
Maharashtra	61	3.7	0.1
Punjab	122	6.9	0.2
West Bengal	101	5.5	0.2

2.2 Causes of maternal deaths

The major complications that account for nearly 75% of all maternal deaths are:

- Haemorrhage (mostly postpartum haemorrhage)
- Infection
- Pre-eclampsia and eclampsia
- Obstructed labour and other complications of delivery
- Embolism
- Unsafe abortion

The remaining are caused by diseases such as malaria, anaemia and HIV/AIDS during pregnancy.

2.3 'Near miss'

It is defined by the WHO as the near death of a woman from a complication during pregnancy, childbirth or within 42 days after the termination of pregnancy.[12] Investigating near misses provides an opportunity to understand factors contributing to maternal mortality and how it can be prevented, particularly where MMR is low, and the event of maternal death is rare.

3 Perinatal and neonatal mortality

Nearly three million babies are stillborn every year worldwide with a global stillbirth rate of 18.4/1000 births.[13] The WHO's goal of **Every Newborn: An Action Plan To End Preventable Deaths** aims to reduce the stillbirth rate to 12 or less per 1000 births by 2030 in every country, and for countries already meeting this target to reduce equity gaps. There is currently no systematic reporting for the causes of stillbirths. The WHO has therefore included International Statistical Classification of Diseases and Related Health Problems-Perinatal Mortality (ICD-PM) as part of ICD to improve reporting of causes of stillbirth and neonatal mortality.[14,15]

According to WHO, the **perinatal period** commences at 22 completed weeks (154 days) of gestation and ends seven completed days after birth. The causes of perinatal mortality (PM) are listed in Table 1.3.

Table 1.3 Causes of stillbirths and early neonatal deaths in low- and middle-income countries[19]

Cause	Late stillbirth *n*=416 *n* (%)	Early neonatal deaths *n*=271 *n* (%)
Hypertensive disorders	98 (23.6)	22 (8.1)
Antepartum haemorrhage	68 (16.3)	20 (7.4)
Intrapartum asphyxia	66 (15.9)	106 (39.1)
Fetal abnormality	12 (2.9)	12 (4.4)
Infections	7 (1.7)	1 (0.4)
Maternal disease	6 (1.4)	1 (0.4)
Spontaneous preterm births	5(1.2)	104 (38.4)
Intrauterine growth restriction	4 (1.0)	0
Trauma	0.7	
Miscellaneous	0.7	
Unexplained intrauterine death	34.6	

The **neonatal period** begins with birth and ends 28 complete days after birth. Neonatal deaths may be subdivided into:

- **Early neonatal deaths,** occurring during the first seven days of life (0–6 days).
- **Late neonatal deaths,** occurring after the seventh day but before the 28th day of life (7–27 days).

The first 28 days after birth are the most critical days for survival for a newborn with a global neonatal mortality of 18/1000 live births in 2017. 2.5 million babies die globally in a year in the first month of life, about one million dying on the first day and another one million in the next six days of the first week. (UNICEF 2018).[16]

The common causes of neonatal death are congenital malformations, prematurity, intrauterine hypoxia during pregnancy and delivery, and infection. It is now clear that agents which do not harm the mother can damage rapidly growing tissues of the fetus. The damaging effects of X-rays and rubella virus are among the few that are well known. Thalidomide disaster is a classic example of a seemingly harmless drug used in early pregnancy for relief of morning sickness. In spite of an intensive witch-hunt for possibly teratogenic drugs in addition to thalidomide, remarkably little has so far been substantiated. There are two reasons for this – firstly, the natural incidence of fetal abnormality (2–3% of all babies, alive or dead) for which no explanation can be found. Secondly, the species difference, which invalidates the observations made on experimental animals to some extent, as they may not necessarily apply to the human fetus.

According to the report of Ministry of Family Welfare, Government of India 2017, the overall PNMR in India declined from 37/1000 births (live births + stillbirths) in 2006 to 23/1000 in 2015; the rural perinatal mortality rate (PNMR) was 26 and urban was 15/1000. The stillbirth rate over the same period declined from 9/1000 to 4/1000.[17]

For comparison, the **extended PNMR** (stillbirths + neonatal deaths) of UK in 2017 was 5.64 per 1000 total births, comprising of 3.93 stillbirths per 1000 total births and 1.72 neonatal deaths per 1000 live births.[18]

4 High-risk pregnancy

One of the responsibilities of an obstetrician is to identify women at high risk for pregnancy, labour and delivery. This helps the obstetric team, the patient and her family to plan and prepare for the extra care that a woman may require to achieve a normal pregnancy outcome. It does not necessarily mean that there will be a problem with the mother or the baby, if the necessary precautions are taken. Table 1.4 gives a list of high-risk factors. This list is by no

Table 1.4 High-risk factors in pregnancy

Category	Condition
Pre-existing medical conditions	• Hypertension • PCOS • Diabetes • Heart disease • Respiratory disease • Chronic kidney disease • Autoimmune disease • Thyroid disease • Obesity • History of deep vein thrombosis • HIV positive status
Age	• Teenage <18 years • Primigravida >35 years
Pregnancy complications	• Multiple gestation • Gestational diabetes • Pre-eclampsia/eclampsia • Antepartum haemorrhage • Previous preterm birth • Fetal growth <10th percentile • Rh sensitisation • Anomalous fetus
Surgical history	• Previous caesarean section/s • Previous myomectomy • Multiple abdominal surgeries
Lifestyle factors	• Alcohol use • Tobacco use • Drugs/substance abuse

PCOS, polycystic ovary syndrome.

means all-inclusive, and a risk factor for a specific pregnancy may not be a risk for another pregnancy.

5 Pre-pregnancy care

Antenatal care should ideally begin before conception while planning pregnancy. Preconception clinics can offer much in terms of prevention of pregnancy mishaps by ensuring that pregnancy is embarked upon with as few risk factors as possible. Besides a general check-up to confirm physical and mental fitness of the would-be parents, folic acid supplementation should be started while planning pregnancy. It may be too late by the time pregnancy is diagnosed and folic acid commenced, as most major malformations have already occurred in the first 8–10 weeks. The recommended dose is 400 µg daily in women with no previous history of neural tube defect (NTD) and 4 mg/day in those who have an affected child.

Immunity to Rubella should be checked and immunization given to those who are non-immune. Screening for thalassaemia should be offered to all as the incidence of thalassaemia is relatively higher in India, Southeast Asia, Africa, Central America and Middle Eastern and Mediterranean countries.

Advice regarding diet and exercise is important for all, but more so in overweight and obese, as they have a higher risk of developing gestational diabetes and hypertension. The hazards of tobacco and alcohol in pregnancy should be impressed upon, and help should be provided to quit smoking and alcohol.

Preconception counselling is particularly advantageous in women with pre-existing medical conditions like diabetes, epilepsy, asthma, chronic kidney disease, depression, etc. Optimizing the medication and the medical condition certainly help to make the pregnancy safer for the mother and improve perinatal outcomes.

6 Antenatal care

Besides the many benefits of supervised antenatal care and hospital delivery to women and their newborn is that it provides the first opportunity ever for a comprehensive health check-up, and its implications go far beyond immediate obstetric considerations. Notable examples are cases of nutritional anaemia and cardiac disease that are diagnosed and treated during pregnancy. It may not be possible to set up blood banks in every remote corner of the country, but it is certainly possible to build a natural blood bank in the woman's body by building up her haemoglobin during pregnancy so that she can withstand a reasonable amount of blood loss during delivery. The incidence of eclampsia can be lowered to an irreducible minimum, premature labour can to some extent be prevented or at least postponed to allow the effect of antenatal steroids, and many of the more dramatic disasters of labour

itself can be forestalled by early recognition of their causes. Above all, the patient's emotional reactions to her pregnancy and her fear of labour can be addressed so that she is better prepared for labour, both physically and mentally, and has a positive childbirth experience.

The aim of antenatal care should be to provide respectful, individualised, patient-centred care, which integrates effective interventions and tests, provides relevant and timely information, psychosocial and emotional support at every contact.

7 Booking visit

The earlier the better, but ideally a visit should be made before 10 weeks of pregnancy. The following is a brief summary of procedures carried out at the first antenatal visit.

7.1 History-taking

It should be dealt under the following headings:

1. **Past history.** It should include details of previous hospitalization, if any, and specific enquiry should be made into a history of hypertension, diabetes, thyroid disorders, urinary infections, asthma, tuberculosis, rheumatic fever, fits, nervous breakdowns and any past history of surgical procedures. Any known allergy to food and drugs and history of blood transfusion should be noted. It is also important to enquire and make a note about any medication that she is taking chronically, and whether it has been continued during pregnancy.
2. **Menstrual history.** It should be noted not only the last menstrual period but also the menstrual cycle and any irregularities. This information may help later to settle a doubt about the maturity of the fetus, although this is becoming increasingly redundant with the use of a routine ultrasound in early pregnancy which provides very accurate dating. Any period of antecedent involuntary infertility is also worth recording, as also previous contraceptive practice.
3. **Obstetric history.** Details of every pregnancy whether terminating in miscarriage, preterm or term delivery must be noted under the following headings:
   - Details of delivery
     - Duration of pregnancy
     - Labour – spontaneous/induced
     - Duration of labour
     - Mode of delivery (vaginal/caesarean)
     - If operative delivery – indication
     - Live born/stillborn
     - Birth weight and sex
     - Breastfeeding history
     - Present health of child
     - Antepartum/intrapartum/postpartum complications, if any
   - Abortion details should include:
     - Period of gestation
     - Spontaneous/induced abortion
     - Medical/surgical termination
     - Whether any operative intervention like curettage
4. **Family history.** It should take into account history of hypertension, diabetes, thyroid disorders, pulmonary tuberculosis, heart disease, multiple pregnancy, congenital diseases and consanguinity.
5. **Present history.** Unlike history taking in patients suffering from a disease, it is less important since pregnancy is a physiological state and most symptoms need only general counselling and advice. Nevertheless, the woman should be given a patient hearing and reassured, even if it is to allay her anxiety. Most women reply in the affirmative, if asked about headaches, backache or discharge, and almost half of them admit to constipation, if questioned directly. There is not much point in making an impressive list of symptoms too irrelevant for the patient to bother to mention.

7.2 Booking examination

The weight and height of the patient must be recorded at the booking visit and the body mass index (BMI) calculated.

General medical examination should include assessment of the patient's gait as she enters the room as a pointer to asymmetry of the pelvis or deformity of the spine. The thyroid is palpated, and the triangles of the neck are examined for the presence of enlarged lymph nodes. While the patient is sitting up for this, the vertebral column should be looked at for any signs of

deformity. The hands and nails are examined for evidence of tremor, edema, koilonychia and pallor of the nailbeds. The legs are looked at for the presence of varicose veins and edema, and the feet for serious degrees of deformity.

Examination of the heart and chest should now follow. Ideally this is the time when the blood pressure should be recorded, the patient having settled down so that a reliable reading can be obtained.

The **abdomen** is next examined, particular attention being paid to the size of the uterus, if palpable.

Traditionally, a vaginal examination was performed in the first trimester to assess the size of the uterus and exclude pelvic tumours, provided there was no history of recent bleeding. It is however unnecessary in the present era of ultrasound.

A **Pap smear** may be taken if it is due. The value of routine **antenatal cervical cytology** in low-resource countries is debatable. Almost 50% of pregnant women are under 30 years of age in whom the yield of persistent and more severe dysplasias is unlikely to be high. Moreover, there is a considerable chance of getting false positive result during pregnancy and an expert cytopathologist is needed for accurate interpretation, particularly of high-grade lesions. Management protocols essentially remain the same as in the non-pregnant state but the increased rate of complications, especially haemorrhage and abortion, make it advisable to be sure of the indication before rushing into colposcopy and cervical biopsy. While it is important, of course, never to miss a case of invasive cancer of the cervix in pregnancy, it must be remembered that these are seldom diagnosed by routine cytological screening, which is essentially a method of screening for pre-cancerous lesions. Cytological screening may be worthwhile in the older multipara who is liable to default from postnatal attendance.

7.3 Investigations at booking

Routine blood and urine tests which are advised at booking are as follows:

- Haemoglobin estimation, a full blood count and a peripheral blood smear examination, if haemoglobin is less than 11 g/dL.
- Blood grouping including Rh typing. If the patient's blood group is Rh negative, her husband's blood group is tested. If he is Rh positive, an indirect Coombs test (ICT) is requested for the patient.
- Screening for infections which can affect both mother and her off spring – hepatitis B, C, syphilis (VDRL) and HIV.
- Immunity to Rubella (IgG antibodies).
- Screening for thalassaemia by haemoglobin electrophoresis. Routine screening for sickle cell disease is offered only in high prevalence areas, namely the tribal areas of Madhya Pradesh, Maharashtra, Gujarat, Odisha and Chhattisgarh.
- By virtue of their ethnic origin, all Indians are at a higher risk of diabetes. Blood sugar levels fasting or random should be done at booking visit to detect overt diabetes. The diagnostic cut-offs are the same as for non-pregnant. A fasting plasma glucose ≥126 mg/dL or random plasma glucose ≥200 mg/dL is considered diagnostic of diabetes mellitus.
- Screening for hypothyroidism in all pregnant women is not mandatory. However, there is some evidence to suggest that universal screening in pregnancy is cost-effective and may be beneficial.[20] A measurement of thyroid-stimulating hormone may be therefore incorporated as part of the booking investigations, if it is feasible.
- A mid-stream urine specimen is examined for protein, sugar and, if vomiting has not yet ceased, for acetone. A urine culture should be requested to exclude asymptomatic bacteriuria, and if significant growth is found, should be treated sooner than later, as ascending pyelonephritis is more common in pregnancy if the urinary infection is not treated timely.
- Routine screening for bacterial vaginosis, chlamydia and cytomegalovirus is **not recommended.**

8 Subsequent visits

Provided pregnancy continues without complications, the patient should be seen at least every four weeks until 28 weeks, thereafter every two weeks until 36 weeks and then weekly until delivery. The number of visits in standard antenatal

care is generally 11–15 visits. According to WHO, there should be a minimum of eight visits in first pregnancy, one in first trimester, two in second and five in third trimester to give a positive pregnancy experience to women and reduce PM.[21]

Blood pressure. BP is recorded at every visit.

Traditionally maternal weight and urinalysis for protein is also done at each visit, although their utility is debatable.

Weight. Should the women be weighed at every visit is debatable. The practice of routine measurement of weight was based on some evidence that weight gain more than two pounds (0.9 kg) in any week in the third trimester could be associated with pre-eclampsia, and lower weight gain can predict small for gestation. The later studies failed to show these correlations and the policy of routine weighing at each antenatal visit was discontinued as per the National Institute for Health and Care Excellence guidelines 2003.[22] However, monitoring weight in overweight and obese women may provide an opportunity for lifestyle interventions to reduce maternal weight gain in pregnancy and decrease the risk of pre-eclampsia and gestational diabetes.[23,24]

Urinalysis for protein. Most antenatal clinics do a routine urinalysis for protein and sugar at every antenatal visit. Proteinuria generally follows rise in blood pressure. A study in 1000 antenatal women showed that only six women developed proteinuria before the onset of hypertension. It concluded that routine urinalysis for proteinuria at every visit in low risk women, without any objective evidence of hypertensive disorder, is a poor predictor of pre-eclampsia, and can be eliminated.[25] The international evidence-based guidelines are divided on this issue, some recommend[26,27] and others advise against[28,29] urinalysis at every visit.

Abdominal examination. It should be performed at every visit once the uterus becomes palpable. Examination should be done on an empty bladder, in a dorsal position with knees little flexed.

Inspection of the abdomen should look for size, shape, rashes, striae gravidarum, scars, bruises, fetal movements and contractions.

Palpation is done to assess fetal growth, the presentation, position and engagement of presenting part.

Fundal height should be recorded, either by the arbitrary landmarks or by measurement of symphysial fundal height (SFH) using a tape. There is no evidence to suggest that a tape measurement of SFH is better than clinical palpation in detecting intrauterine growth restriction (IUGR).[30]

Lateral palpation helps to ascertain the fetal position/lie (longitudinal, oblique or transverse). It is done by placing both hands on either side of the uterus, one displacing the baby to the other hand which palpates along the length of the uterus.

Pelvic palpation or grips help to determine the presenting part and if it is engaged.

Presence of adequate amount of amniotic fluid must be estimated, fetal movements noted and fetal heart sounds auscultated.

8.1 Ultrasound

Ultrasound in the early first trimester, between 7 and 10 weeks, may be done optionally to confirm fetal viability, particularly if there has been an episode of bleeding in the current pregnancy, or there is history of missed abortion in previous pregnancy. Other advantages of first trimester ultrasound include accurate dating of pregnancy which increases the accuracy of biochemical screening for aneuploidy (which is gestational age sensitive), and early diagnosis of multiple pregnancy and its chorionicity.

Ultrasound for nuchal translucency (NT) should be offered between 11 weeks and 13 weeks and 6 days to all, provided it can be measured correctly by an experienced ultrasonologist.

A detailed level II ultrasound or anomaly scan (or genetic sonogram) at 18–20 weeks of pregnancy is now a standard of care and should be advised to all women. Besides confirming the gestational age and placental localisation, the most important of all, a systematic evaluation is performed to exclude congenital malformations. If the results of the triple test are available and screen for NTD is positive, the information should be conveyed to the ultrasonographer to do a targeted scan to look for NTD.

8.2 Screening for Down syndrome

First trimester combined screening is provided between 11 and 13 weeks +6 days. It combines NT on ultrasound and measurement of β-hCG and

pregnancy-associated plasma protein-A in maternal blood.

If the patient books late or first trimester screening is not available, a **triple test** (α-fetoprotein, β-hCG and estriol) or a **quadruple test** (triple + inhibin A) can be offered between 15 and 19 weeks. The results of these biochemical tests together with age are used to calculate a risk score. If the risk is high, a diagnostic test like amniocentesis is offered (*see* Chapter 3, *Prenatal Screening and Diagnosis of Birth Defects* for details). Alternatively, some institutions have a policy of integrated screening for Down syndrome in which the results of both first and second trimester screenings are combined to calculate the risk.

8.3 Haemoglobin estimation

Haemoglobin estimation should be repeated around 24–28 weeks and at 36 weeks. This ensures that the haemoglobin level before labour is at least 11 g/dL as recommended by WHO, and reduces the need for parenteral iron therapy by the detection of iron deficiency earlier. It also helps in identifying folic acid deficiency and calling for a much earlier investigation of a patient's anaemia, if it fails to respond to treatment.

8.4 Screening for gestational diabetes

One-step screening for gestational diabetes is now performed at 24–28 weeks by a 75 g glucose challenge test. Three samples are taken, fasting, one hour and two hours after taking 75 g glucose. If any one result is abnormal, gestational diabetes is diagnosed (*see* Chapter 7, *Anaemia* for details).

8.5 Routine antenatal anti-D prophylaxis for RhD-negative women

It is now our practice to repeat the ICT at 28 weeks in all women who are Rh negative and offer prophylactic anti-D to non-immunised women.[31] Routine antenatal anti-D prophylaxis can be given as follows:

- Either two doses of 500 IU of anti-D at 28 and 34 weeks gestation

  OR
- Single dose of 1500 IU of anti-D at 28 weeks gestation

In either case, it is followed by a further dose of anti-D given at or within 72 hours of delivery, if the infant is RhD positive. Although it is very unusual for isoimmunization to occur during the first pregnancy without some placental accident, if antibodies are detected in the booking blood specimen, the patient should be referred to a specialized unit for appropriate management.

8.6 Tetanus immunization

As per Department of Health and Family Welfare, Government of India guidelines 2008, all women should receive two injections of tetanus toxoid during pregnancy for the prevention of neonatal tetanus. The first injection can be given in early pregnancy any time followed by the second dose after an interval of at least four weeks but preferably before 36 weeks of pregnancy to ensure adequate antibody levels in the fetus at the time of delivery. An injection of tetanus toxoid should be given to a woman in labour, if she has not previously received tetanus vaccine. Women who had their last pregnancy less than three years ago and received two injections in the previous pregnancy need to receive only one booster dose in the current pregnancy.[32]

According to WHO, A third dose is recommended six months after the second dose, in the postpartum period, which extends the period of protection to at least five years.[33]

Tdap (tetanus, diphtheria and acellular pertussis) vaccine is now advised during pregnancy instead of the second dose of tetanus toxoid alone. This is to provide passive immunity to the infant against these infections till the time the infant is vaccinated, which is usually at the age of 6–8 weeks. The dose of Tdap is recommended at 27–36 weeks of pregnancy to maximize maternal antibody response and provide best protection from pertussis in babies up to 2 months.[19]

8.7 Pelvic assessment

A routine pelvic assessment to exclude disproportion is not done in the current obstetric practice, unless it is indicated clinically. In primigravidae, the head is usually engaged by 37 weeks. If it is not,

it is important to exclude disproportion and to look for other causes, for example, big baby, pelvic tumours, a full bladder or occiput posterior position. This, however, is not justification enough for an elective caesarean section as labour is the best test for pelvic adequacy. Conversely, the deeply engaged head can easily be mistaken for the engaged breech with extended legs and vice versa.

8.8 Imaging during pregnancy

It is not advisable to X-ray pregnant women except when clinically indicated. Yet, it is important not to miss undiagnosed pulmonary tuberculosis in pregnancy; or in a cardiac patient, if required for management, a chest radiography should not be denied to a woman. The abdomen is shielded with a lead apron. The radiation dose of plain X-ray chest is well within the permissible limits and does not warrant anxiety even if this simple precaution has not been observed. Any radiation exposure in pregnancy less than five rads is considered safe and does not warrant termination of pregnancy for fear of radiation-induced birth defects. Radiation doses of some commonly performed X-rays and CT scans is given in Appendix C.

Magnetic resonance imaging is safe in pregnancy as there is no risk of radiation.

8.9 Weight gain during pregnancy

The weight gain is contributed by the uterus and its contents, that is, the fetus and amniotic fluid, the deposition of maternal fat in the breasts and elsewhere, and increased blood volume as well as extracellular fluid. The weight gain should not exceed 2½ kg in a month or 0.9 kg in a week.

There are no Indian guidelines on how much weight a woman should gain during pregnancy. The Institute of Medicine, USA, guidelines on gestational weight gain which are based on the pre-pregnancy BMI[34] are listed in Table 1.5.

Excessive weight gain, in women who were normal or overweight according to their pre-pregnancy BMI, has been shown to be associated with increased incidence of gestational hypertension and birth weight >4000 g.[35] Low maternal weight gain (<6 kg) in underweight women may be associated with IUGR. But poor weight gain in morbidly obese women reduces the risk of adverse pregnancy outcome. Therefore, maternal weight gain during pregnancy does not necessarily correlate with the fetal weight and the best predictor of fetal birth weight is the maternal pre-pregnancy weight.

8.10 Diet and supplements

The first requisite is an adequate supply of fluid, and the patient should be advised to take a litre of fluid over and above her usual intake. It is the best and most natural defence against constipation and helps to reduce stasis in the urinary tract which increases the risk of urinary tract infection. The intake of caffeine and alcohol, however, should be restricted. Constipation is a common complaint during pregnancy. Besides fluid intake, a diet which contains more fibre, commonly referred to as 'roughage' also helps to treat constipation naturally. Of these, fruits and vegetables are among the most important.

A dietician should review the diet of all patients on booking and give advice. 'Eating for two' is a myth and results only in excessive weight gain during pregnancy which increases pregnancy complications and is difficult to shed off later.

The **daily caloric intake** should be increased by about 300 kcal, the normal daily requirements in pregnancy do not generally exceed 2500 kcal. The **protein intake** needs to be increased by

Table 1.5 Weight gain during pregnancy according to pre-pregnancy BMI[34]

Preconception BMI	Total weight gain in pregnancy in kg	Incremental weight gain in 2nd and 3rd trimester Mean (range) in kg/week
Underweight (<18.5 kg/m^2)	12.5–18	0.51 (0.44–0.58)
Normal weight (18.5–24.9 kg/m^2)	11.5–16	0.42 (0.35–0.50)
Overweight (25.0–29.9 kg/m^2)	7–11.5	0.28 (0.23–0.33)
Obese (≥30.0 kg/m^2)	5–9	0.22 (0.17–0.27)

15 g/day. About 70–90 g of protein and 60 g of fat per day are desirable levels of intake, but it is not much use telling a woman to eat 70 g of protein, if she does not know where it comes from. It is important, therefore, to give simple advice about what and how much to eat. Most well-to-do women eat a reasonably well-balanced diet, but in the poorer classes, carbohydrates form the bulk of the diet because they are cheaper, and protein intake may be inadequate. Also, in pure vegetarians, the intake of protein needs to be assessed and supplemented, if necessary.

Even the apparently well-nourished, however, are liable to a deficient intake of iron and vitamin D, and iron deficiency anaemia is still common.

Iodised salt should be used to meet the increased demands of iodine in pregnancy.

Vitamin A should not be given as a supplement routinely as high intake may be teratogenic.

Iron and folic acid intake. The daily requirement of **elemental iron** is about 20 mg, and during the last three months of pregnancy the baby makes the greatest demands upon the available stores. Liver, green vegetables and meat are natural sources of iron. Women should be encouraged to consume iron rich food and advised to avoid tea and coffee immediately after meals as it interferes with iron absorption from the gut. According to Government of **India National Health Policy 2017** recommendations, all pregnant women must receive a tablet of **100 mg of elemental iron and 500 µg of folic acid** for at least **100 days** in pregnancy starting after first trimester, and for another 100 days postpartum. In anaemic women (haemoglobin less than 11 g/dL), two tablets of iron and folic acid must be given daily for 100 days.

WHO recommends daily oral iron and folic acid supplementation with **30–60 mg of elemental iron and 400 µg (0.4 mg) of folic acid** in pregnant women to prevent maternal anaemia. The equivalent of 60 mg of elemental iron is 300 mg of ferrous sulfate heptahydrate, 180 mg of ferrous fumarate, or 500 mg of ferrous gluconate.[33] Iron should not be prescribed to women with good haemoglobin as it is of no benefit to the mother or the fetus, and may be potentially harmful.

Periconceptional folic acid has been shown to reduce the risk of NTDs and other birth defects like cleft lip and congenital heart disease and it should be started preferably before pregnancy and continued through the first trimester. The recommended dose of folic acid in women without any history of previous NTD affected baby is 400 µg/day, and 4 mg/day in women with an affected pregnancy. However, the most commonly available folic acid tablet marketed in India is 5 mg and is therefore the default prescription.

Calcium intake A litre of milk a day would go very far towards meeting the dietary demands of the pregnancy, including 1000 mg of calcium, in addition to proteins and vitamins A and D, and all women should be encouraged to consume that much. Half a litre a day at least should be insisted upon. The essential calcium requirements can then be supplemented through other natural sources such as fruits and vegetables or supplements. About 80% of the total fetal calcium is deposited in the third trimester. Adequate calcium supplementation may play a role in the prevention of pregnancy induced hypertension as well. Salt encourages the urinary excretion of calcium, so its intake should be minimised.

In populations with low dietary intake of calcium, **WHO** recommends **1.5–2.0 g of oral elemental calcium supplementation** daily. It should be given in divided doses with meals, preferably with an interval of several hours between iron and calcium supplements.[36]

Vitamin D South Asian women are at a higher risk of vitamin D deficiency, and a supplement of **400 IU (10 µg)** daily can be given.[27]

A normal diet reinforced as above with leafy vegetables, fruits and nuts and supplemented with at least 500 mL of milk, will meet the nutritional demands of normal pregnancy. Bananas are an inexpensive and healthy source of calories, vitamins and minerals. Groundnuts and jaggery are an excellent supplement for the low-income groups.

8.11 Work

Most women with uncomplicated pregnancies can continue to work during pregnancy.

8.12 Exercise

Women who do not have any additional risk factors for adverse maternal or perinatal outcome may start or continue moderate exercise during pregnancy.[27] As a general guideline, 30 minutes or more of moderate exercise a day on most, if not all, days of the week is recommended for pregnant women.[37]

Exercise increases the pulse rate, but the blood pressure and temperature remain unaffected. There is no effect on the fetal heart rate, though there may be an increase in variability. Being active during pregnancy also helps in reducing backache, constipation and edema.

Of all types of exercise, walking is the most natural and suitable and also the most preferred. Exercises that use multiple muscle groups increase the sensitivity of peripheral tissues to insulin and therefore, particularly benefit type 2 diabetics. To this end, golf and swimming are also good sports, although diving is contraindicated. Sports as energetic as tennis and contact sports should be avoided. Horse riding, cycling and skiing are also not advisable because of increased danger of falling. Scuba diving is not advisable at any time during pregnancy as it may result in fetal birth defects and fetal decompression disease. In general, it is safe to continue all forms of exercise to which the woman has been habituated before embarking on her pregnancy, including aerobic exercises, albeit at a lower physical scale. All exercises should be stopped short of fatigue and not continued to exertion. Exercises that involve lying in the supine position should be avoided after the first trimester and also those that require prolonged periods of motionless standing or carry a risk of even mild abdominal trauma. Besides the benefit of exercise on the musculoskeletal system, the mental benefits are mediated through raised levels of beta-endorphins. This effect can be of great benefit in reducing the perception of pain in labour.

Antenatal classes are organized in most good maternity units, designed to teach exercises to pregnant women to maintain fitness during pregnancy and promote relaxation in labour in the hope of expediting it and making it less painful.

8.13 Rest

This is just as important as exercise. A minimum of eight hours in bed at night, preferably 10, is recommended, and during the afternoon the expectant mother should be encouraged to lie down or at least put her feet up for an hour.

8.14 Smoking

Smoking poses serious hazards for pregnancy, the mean birth weight of the babies of mothers who smoke is lower and the prematurity rate higher than in non-smokers, irrespective of social class and parity.[38,39]

8.15 Alcohol

Though small amount of alcohol, 1–2 units/week (1 unit = 10 mL of pure alcohol), after the first trimester may not affect the fetus, there is no known safe limit of alcohol use in pregnancy. Therefore, the safest for women trying to conceive, during pregnancy and breastfeeding is to avoid alcohol completely. There is also no safe time in pregnancy to drink, and all kinds of alcohol are equally harmful including wine and beer.[40] Alcohol intake during pregnancy can cause miscarriage, stillbirth and a range of lifelong physical, behavioural and intellectual disabilities, collectively known as fetal alcohol spectrum disorders (FASDs) which includes fetal alcohol syndrome (FAS). Drinking in first trimester is more likely to cause facial defects, miscarriage and premature birth, but growth and nervous system disorders can occur due to exposure to alcohol at any time in pregnancy since the brain continues to grow throughout pregnancy. The effect on the fetus is dose dependent, its severity varying with the amount and frequency of alcohol intake. FAS is the more severe form of FASD, and the affected children usually have severe physical and mental disability.

8.16 Travel

For the patient who has a known tendency to abort, travel is contraindicated during the first trimester. Women at risk of preterm labour should also avoid travel. Long car journeys should be interrupted about every two hours in order to allow a change of position and the re-es-

tablishment of healthy circulation. Travel by air nowadays in pressurised aircraft has no risks to pregnancy and is particularly suitable for long journeys because it reduces the travel time. Long duration air travel increases the risk of venous thrombosis for which in-air exercises and maintaining good hydration can help to reduce the risk. When planning air travel in third trimester, airline website must be consulted, and necessary medical documentation obtained as airlines have their own policy till which gestation they will fly pregnant women.

8.17 Sexual intercourse

Pregnant women should be informed that sexual intercourse during pregnancy is not known to be associated with any adverse effects unless there is a history of bleeding in the pregnancy or a low-lying placenta.

8.18 Dental hygiene

As the gums become soft and more liable to bleed in pregnancy, it is desirable to use a soft brush. There is no evidence that dental caries progresses more rapidly because of the calcium demands of the fetus, nevertheless, any dental infection must be treated. Reparative dental work can safely be carried out at any stage of pregnancy.

Table 1.6 gives a suggested plan of antenatal visits. The visits may be reduced to eight or more in low resource settings.

Table 1.6 Checklist for antenatal visits for uncomplicated singleton pregnancies

Visit 1 (Booking visit; earliest, up to 10 weeks)
- Medical and obstetric history
- Measure BP, record height, weight and calculate BMI
- Routine investigations (include ICT in Rh negative)
- Pap smear if due
- Discuss first trimester screening
- Request ultrasound for viability and dating
- Prescribe folic acid
- Dietary advice and prescription for nausea/vomiting if required

Visit 2 (earliest, up to 10 weeks)
- Review investigations and ultrasound reports
- Confirm EDD with ultrasound, reassign if difference ≥5 days
- Explain 1st trimester combined screen for Down syndrome
- Request ultrasound and double marker at 11 to 13+6 weeks

Visit 3 (12–14 weeks)
- Review combined screen result
- Confirm EDD with ultrasound, reassign if difference ≥7 days
- Routine antenatal assessment: BP, weight
- Prescribe iron and calcium as per requirement
- Refer to educator for diet counselling and exercise

Visit 4 (16 weeks)
- Routine antenatal assessment: BP, weight, abdominal palpation
- Request level II (anomaly scan) at 18–19 weeks
- Tetanus immunization: 1st dose

Visit 5 (18–20 weeks)
- Review Level II scan report
- Check placental location, repeat scan at 34 weeks if placenta low-lying
- Check cervical length for risk of preterm labour

Visit 6 (24 weeks)
- Routine antenatal assessment: BP, weight, abdominal palpation
- Advise Hb, GTT, ICT (for Rh negative)

Visit 7 (28 weeks)
- Routine antenatal assessment: BP, weight, abdominal palpation
- Check investigations advised in previous visit
- Anti-D for Rh negative if ICT negative: 1st dose
- Tdap vaccination

Visit 8 (32 weeks)
- Routine antenatal assessment: BP, weight, abdominal palpation

Visit 9 (34 weeks)
- Routine antenatal assessment: BP, weight, abdominal palpation
- Repeat ultrasound if placenta low lying at level II scan
- Anti-D prophylaxis for Rh negative: 2nd dose

Visit 10 (36 weeks)
- Routine antenatal assessment: BP, weight, abdominal palpation
- Complete blood count
- Discuss delivery plans
- Reinforce exercise

Continued....

Table 1.6 *....Continued*

Visit 11 (37 weeks) • Routine antenatal assessment: BP, weight, abdominal palpation	**Visit 13 (39 weeks)** • Routine antenatal assessment: BP, weight, abdominal palpation
Visit 12 (38 weeks) • Routine antenatal assessment: BP, weight, abdominal palpation • Provide information regarding signs of onset of labour, and when to go to hospital for admission	**Visit 14 (40 weeks)** • Routine antenatal assessment: BP, weight, abdominal palpation • Discuss induction of labour

Key points

- Maternal mortality is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related or aggravated by the pregnancy but not from accidental or incidental causes.
- Maternal mortality ratio (MMR) is the number of maternal deaths during a given time period per 100,000 births during the same time period.
- The United Nations Sustainable Development Goal target is to reduce MMR below 70 by 2030.
- Gestational weight gain does not correlate well with fetal birth weight.
- Proteinuria mostly follows rise in blood pressure. Routine urinalysis at every visit without any evidence of hypertensive disorder is not useful.
- It is desirable to have a few hours interval between taking iron and calcium tablets for better absorption.
- There is no known safe limit for alcohol. However, intake of 1–2 units/week has not been found to be associated with adverse effects.
- Two doses of tetanus toxoid (TT) are given in pregnancy. It is now advisable to replace the second dose of TT tetanus, diphtheria, acellular pertussis given between 27and 36 weeks.

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